

General software, g2MIGTRACE, and summary from Breakout

**Adam Lyon
(Fermilab/CD)
29 July 2011**

**g-2 Collaboration Meeting
@ Brookhaven Natl' Lab**

Please note:

Nothing here is set in stone. Feel free to critique, complain, make suggestions (and offer to help).

**Problems? Send mail to
gm2-computing@fnal.gov**

We now have dedicated computing resources for g-2 at Fermilab

One interactive VM on GPCF

gm2gpvm01.fnal.gov

Disk storage on the "Bluearc"

1 TB Application space (/gm2/app)

10 TB Data space (/gm2/data)

E821 data (7.7 TB at /gm2/data/bnlData)

Two dedicated slots on *Fermigrid* batch system (can get more opportunistically)

gm2gpvm01 - a VM in the "Grid Computing Center"



But sometimes it can't take the heat



We have collaboration tools @ FNAL too

Public web page

<http://gm2.fnal.gov>



The New Muon g-2 Experiment at Fermilab

Home | g-2 Collaboration | Internal | Contact



The muon g-2 storage ring as installed at Brookhaven.

The goal of the E-989 muon g-2 experiment is:

To measure the muon anomalous magnetic moment to 0.14 ppm, a fourfold improvement over the previous Brookhaven E821 experiment. The muon anomaly is a fundamental quantity, which can be precisely measured and accurately computed within the Standard Model and a comparison of experiment to theory is a sensitive test of the completeness of the theory. The current comparison to the accepted theory shows a deviation of more than 3 standard deviations, which might be an indication of New Physics beyond the Standard Model. We will use the Fermilab beam complex to prepare a custom muon beam that will be injected into the relocated muon storage ring. Our goal is a factor of 20 increase in statistics and a significant reduction in systematic uncertainties compared to the BNL experiment.

Latest News

Jan 2010:
Muon g-2 has Stage I Approval!

May 2010: The [final proposal](#) submitted to DOE

Nov 2009: Full [cost review](#) performed and submitted to the PAC and their [response](#).

March 2009: The initial [proposal](#) for a new muon g-2 experiment was submitted to the March 2009 PAC, and was met with a very positive [response](#).

Related Sites

Muon g-2 Twiki

Muon g-2 at BNL

Fermilab

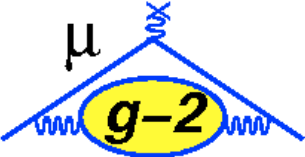
Fermilab

Legal Notices

We have collaboration tools @ FNAL too

DocDB (I'll write up some instructions)

<http://gm2-docdb.fnal.gov:8080/cgi-bin/DocumentDatabase>



Muon g-2

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Document Database

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Show GM2-doc-# -v

Show documents modified in the last days

[Calendar](#) of events or [today's](#) events

List:

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- ◇ [Groups](#)
- ◇ [Keywords](#)
- ◇ [Events](#)

Documents modified in the last 7 days

GM2-doc-#	Title	Author(s)	Topic(s)	Last Updated
61-v1	Muon g-2 Collaboration Bylaws	Dinko Pocanic	Proposal	28 Jul 2011
59-v2	Calorimeter Pulse Processing	Fred Grey	Detector	28 Jul 2011
60-v2	Shimming	David Kawaii	Ring	28 Jul 2011
56-v2	Simulations and Software - Breakout	Adam L Lyon	Computing	27 Jul 2011
58-v1	Project Update	Chris Polly	Proposal	27 Jul 2011
57-v2	Work party 2011	Brendan Casey	Beam Ring Detector Kicker	27 Jul 2011
55-v1	E821 SC Inflector Design	Wuzheng Meng	Beam Ring	26 Jul 2011

Use "private" access,
G2Muon/precess

The only reason to have your
own account is if you want to
"watch" documents

DocDB can handle versioning

We have collaboration tools @ FNAL too

g-2 Redmine Project (Bookmark this one!!)

<http://cdcv.s.fnal.gov/redmine/projects/g-2>

Home My page Projects Administration Help Logged in as Lyon My account Sign out

g-2 Search: g-2

Overview Activity Documents Wiki Files Repository HTML Settings

Overview

+ New subproject

Fermilab Muon g-2 Experiment

This is the main g-2 project.

- You can view everything here by logging in with G2Muon/precess username/password
- To obtain permission to make changes to this site:
 - 1) Log onto redmine with your Services Account
 - 2) Let us know when you are online by sending mail to gm2-computing@fnal.gov
 - 3) We will add you as a developer

Members

Manager: Adam Lyon, Brendan Casey, Chris Polly, Marc Mengel
Developer: Astrid Rodrigues, Brendan Kiburg, David Hertzog, Kevin Lynch, Laura Napierkowski, Lawrence Gibbons, Lee Roberts, Natasha Arvanitis, Peter Winter
GroupAcct: G-2 Experiment account

Resources

Public Web Page	http://gm2.fnal.gov
Wiki	https://cdcv.s.fnal.gov/redmine/projects/g-2/wiki (or just click "Wiki" above)
DocDB	http://gm2-docdb.fnal.gov
Elogs	https://muon.npl.washington.edu/elog/g2/
JIRA GMTWO project (Computing Issue Tracking)	https://fermilab.onjira.com/browse/GMTWO

Questions?

Send mail to gm2-computing@fnal.gov

- Subprojects: G-2 Art Examples, g-2 TWiki Conversion, g2MIGTRACE, g2mtanalysismacros, Gm2SoftwareTools

To view, sign in with
G2Muon/precess

Use your "Fermilab
services password" to
edit stuff and checkout
code

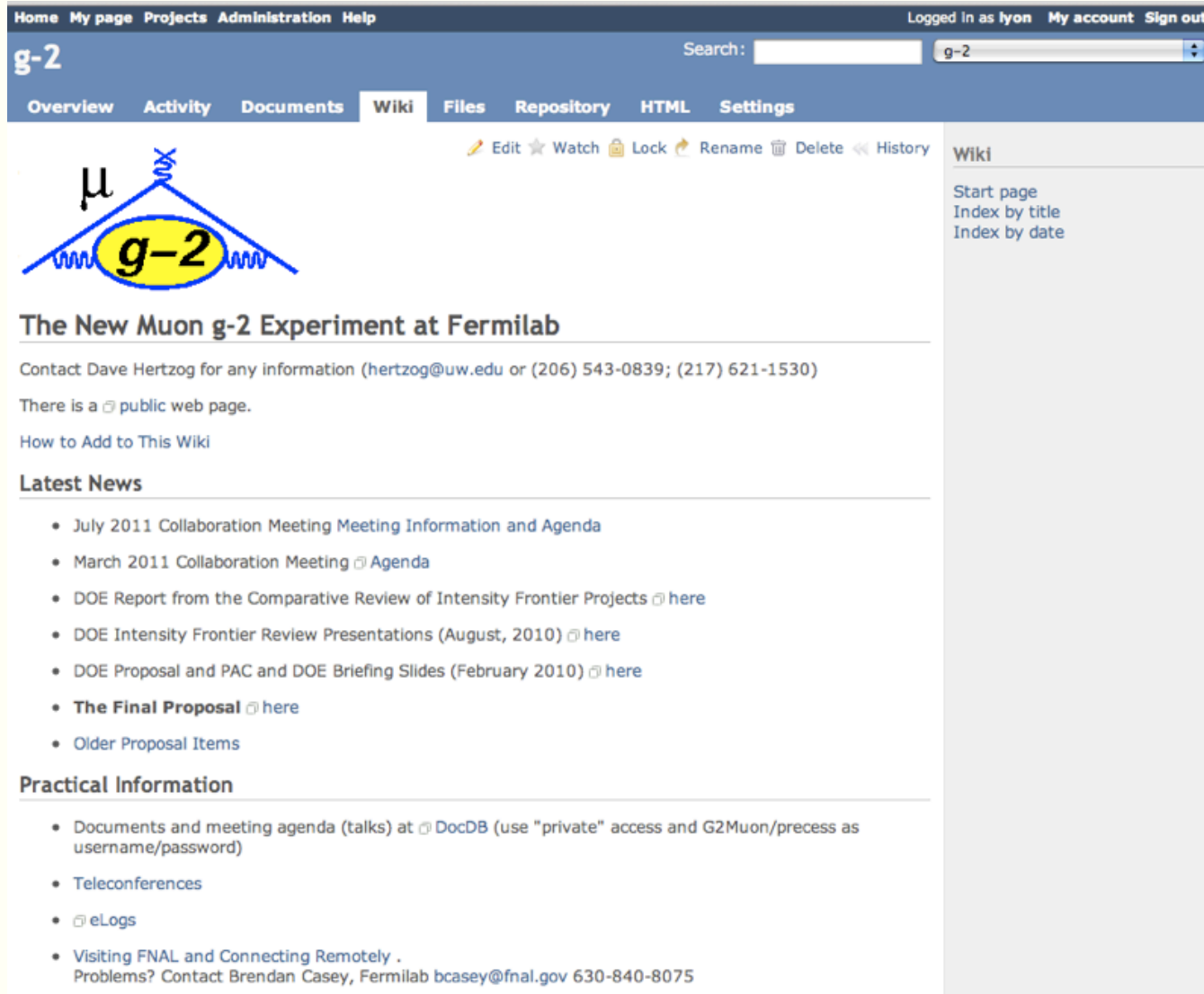
[call 630-840-2345 and ask for it,
then send mail to gm2-computing@fnal.gov to be
added to the access list]

Note link to e-logs

We have collaboration tools @ FNAL too

g-2 Wiki moved to Redmine

<http://cdcv.s.fnal.gov/redmine/projects/g-2/wiki>




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The New Muon g-2 Experiment at Fermilab

Contact Dave Hertzog for any information (hertzog@uw.edu or (206) 543-0839; (217) 621-1530)

There is a [public web page](#).

[How to Add to This Wiki](#)

Latest News

- [July 2011 Collaboration Meeting Meeting Information and Agenda](#)
- [March 2011 Collaboration Meeting Agenda](#)
- [DOE Report from the Comparative Review of Intensity Frontier Projects here](#)
- [DOE Intensity Frontier Review Presentations \(August, 2010\) here](#)
- [DOE Proposal and PAC and DOE Briefing Slides \(February 2010\) here](#)
- [The Final Proposal here](#)
- [Older Proposal Items](#)

Practical Information

- Documents and meeting agenda (talks) at [DocDB](#) (use "private" access and G2Muon/precess as username/password)
- [Teleconferences](#)
- [eLogs](#)
- Visiting FNAL and Connecting Remotely . Problems? Contact Brendan Casey, Fermilab bcasey@fnal.gov 630-840-8075

Wiki

- [Start page](#)
- [Index by title](#)
- [Index by date](#)

Big Picture: Why do we need a software system?

<1> Science demands reproducibility.

Results must come from official, controlled software

<2> We want to work together.

Don't work in isolation - share code

<3> We want to do physics, not computing.

You should not have to deal with infrastructure details

Three pieces to the system

<A> Source code revision control

Track code changes, reproduce versions

 Build system

Easily build code without losing all your hair

<C> Release/environment system

Be able to run standard code and use standard libraries from the above. Set up a standard environment

All of these pieces interact with each other

Goal: Align choices with the Art Framework Project

<A> Source code revision control

Redmine! It's awesome.

<http://cdcvcs.fnal.gov/redmine/projects/g-2>

Can view the repository from Redmine

git - it's a younger, more spry CVS/SVN

Used by most every important open source project

Designed for easy branching, merging, sharing

Designed for coding off the network

Different philosophy – you have a local repository "clone"

E.g.

There is now a "g2migtrace" project in Redmine using a git repository. The old subversion "gm2" project is archived

g-2 » g2MIGTRACE

Search:

g2MIGTRACE

[Overview](#)
[Activity](#)
[Issues](#)
[New Issue](#)
[Gantt](#)
[News](#)
[Documents](#)
[Wiki](#)
[Files](#)
[Repository](#)
[Code reviews](#)
[Settings](#)

root @ develop



Statistics | Branch: develop

Revision:

Name	Size	Revision	Age	Author	Comment
external_libs					
g2MacroFiles					
g2RunTimeFiles					
g2StudyMacros					
include					
patches					
src					
ups					
.gitignore	58 Bytes	2c48a72c	about 1 month	Kevin Lynch	Added external_libs to the ignore list Added t...
CMakeLists.txt	3 KB	c68da5b8	about 1 month	Adam Lyon	Changes necessary to make g2migtrace build the ...
Docmakefile	311 Bytes	337df08d	over 1 year	KevinLynch	Another huge drop, mostly doxygen include/g2Fi...
Doxyfile.html	64.1 KB	7765dbd0	over 1 year	KevinLynch	Doxyfile.html Doxyfile.latex - changed some min...
Doxyfile.latex	64.1 KB	7765dbd0	over 1 year	KevinLynch	Doxyfile.html Doxyfile.latex - changed some min...
GNUmakefile	755 Bytes	e6612613	27 days	Kevin Lynch	Ported from boost::signals to boost::signals2 ...
INSTALL.txt	967 Bytes	0dac7703	28 days	Adam Lyon	Revert "Make note of new instructions" This re...
README-cmake.txt	1.1 KB	c68da5b8	about 1 month	Adam Lyon	Changes necessary to make g2migtrace build the ...
ROOTmakefile	4.4 KB	12f3fe98	over 1 year	Kevin Lynch	Add the LinkDef.h files to the PRECIOUS list so...
Runtimemakefile	907 Bytes	d0829a8c	about 2 years	KevinLynch	Updated makefile to fix a bug in permissions ha...
g2MIGTRACE.cc	11.4 KB	953f2904	about 1 month	Kevin Lynch	Since we've moved to git from subversion, I hav...
gitrev.sh	776 Bytes	19669efe	about 1 month	Adam Lyon	Changed permissions to allow execution

Latest revisions

#	Date	Author	Comment	Code reviews
830b3bd9	07/25/2011 12:30 pm	Kevin Lynch	Merge branch 'hotfix/station_directory' into develop	No reviews
94362191	07/25/2011 12:27 pm	Kevin Lynch	Fix documentation/code mismatch of bug 1530. I fixed the documentation/code mismatch of bug 1530. I modified BOTH the code, so that it makes more sense, and I updated the documentation in the header to match.	No reviews
e6612613	07/01/2011 09:28 pm	Kevin Lynch	Ported from boost::signals to boost::signals2 Ported from boost::signals to boost::signals2. signals2 is header only. I had to update use of std::tr1::placeholders to eliminate some ambiguity issues with signals2. Removed boost library link in	No reviews

Revision 94362191

ID: 94362191c9f5fbc199657d1dc2cf7d6355a61500

Added by Kevin Lynch 3 days ago

Fix documentation/code mismatch of bug 1530.

I fixed the documentation/code mismatch of bug 1530. I modified BOTH the code, so that it makes more sense, and I updated the documentation in the header to match.

Files

Review assignments:  Add

View differences



include

- stationMessenger.hh (diff)



src

- stationMessenger.cc (diff)

b/src/stationMessenger.cc

19	19		#include <exception>
20	20		
21	21		namespace {
22			G4String dir("/g2MIGTRACE/detectors/");
	22		G4String dir("/g2MIGTRACE/detectors/station/");
23	23		G4String front_plate_dir(dir+"front_plate/");
24	24		G4String mid_plate_dir(dir+"mid_plate/");
25	25		G4String back_plate_dir(dir+"back_plate/");

21		2ee31d0b	Kevin Lynch	namespace {
22		94362191	Kevin Lynch	G4String dir("/g2MIGTRACE/detectors/station/");
23		037c552a	Kevin Lynch	G4String front_plate_dir(dir+"front_plate/");
24		037c552a	Kevin Lynch	G4String mid_plate_dir(dir+"mid_plate/");
25		037c552a	Kevin Lynch	G4String back_plate_dir(dir+"back_plate/");
26		037c552a	Kevin Lynch	G4String final_plate_dir(dir+"final_plate/");
27		037c552a	Kevin Lynch	G4String gap_dir(dir+"gap/");
28		22b36b5b	Kevin Lynch	G4String front_hodo_dir(dir+"hodo_front_plane/");
29		22b36b5b	Kevin Lynch	G4String rear_hodo_dir(dir+"hodo_rear_plane/");
30		8c9997b3	Kevin Lynch	G4String calorimeter_dir(dir+"calorimeter/");

** Building code**

The Art framework folks use "cmake" - a system for generating and managing makefiles.

**Pretty easy to understand
(but hopefully you will just "use" it)**

Integrates easily with g2migtrace's build system

Eventually - use "BuildBot" for automated builds.

<C> Release / environment control

You don't want to build *everything* yourself! Need a "repository" of executables and libraries with their associated runtime files

Relocatable ups

"setup gm2 v0_4" sets up your environment

Set your PATH for executables

Sets your LD_LIBRARY_PATH for libraries

Sets other necessary environment variable for finding runtime files, headers

Hold multiple versions of products. Can handle product dependencies

Installation by unwinding tar files - easy for remote sites

CD/REX is investigating *cernvmfs* for remote installations

UPS Release area is large ~10 GB

You install the *cernvmfs* client. Fermilab "projects" a file system to you. You see a "local" filesystem.

Cernvmfs caches the files you actually use (usually a small subset of the total). You can (carefully) go offline

Aside from *cernvmfs*, you don't install anything!

Never have to update your installation; we do that from Fermilab

Under investigation. Also useful for Grid sites

g2MIGTRACE (K. Lynch) uses the software system

In Redmine/Git:

(<https://cdcvcs.fnal.gov/redmine/projects/g2migtrace>)

**Builds with CMake
(calls g2MIGTRACE's Makefiles)**

Releases

-- not yet, you have to build it yourself

What is the main goal here?

**To make g2MIGTRACE compatible with the ART
framework ...**

You can get involved (please do!)

Lots of documentation on the Wiki

Wiki > g-2 Computing & Software > ...

... GPCF

... Software [Developing, g2MIGTRACE]

... Running on Fermigrid

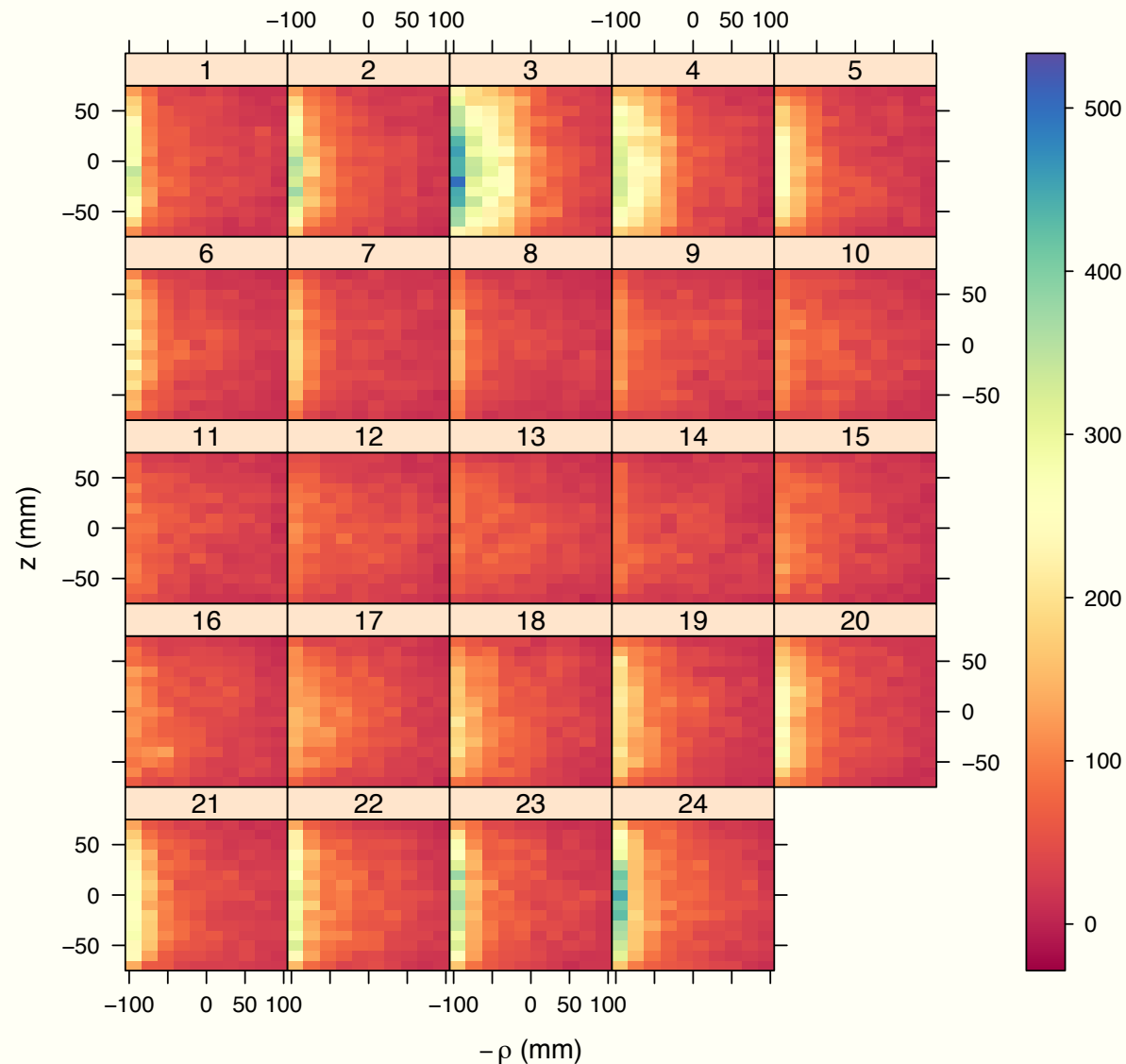
See tutorial and cheat sheets

See Detector talks on DocDB

21 June 2011

28 June 2011

Some sample results I made...



Based on Nathan Froemming's work

Software/Simulation Plans (from Breakout)

Integrate g2MIGTRACE (and other simulations) with the ART Framework

Ensure g2MIGTRACE is acting sensibly and storing muons; determine sanity tests that can be automated

Consider non-Geant techniques (e.g. don't need Geant to simulate uneventful turns)

Repeat previous studies, try full g-2 analysis from MC

Attempt to link simulations

Simulation of pile-up (create a library of pileup events)?

... What is this Art framework ? ...

What is a framework for?

A framework connects packages:

- <1> To input**
- <2> To output**
- <3> To each other**

in a standard way.

Standardizes input/output data and formats

The Art framework - we don't have to reinvent the wheel

Born as CMS-lite (CMS framework with CMS specific stuff removed)

Written by FNAL/CD–CET Group (C++ experts)

Adopted by NOvA, Mu2e, FNAL LBNE group**

Extremely unusual for experiments to share a framework - typically one or more collaborators on each experiment makes a framework for fun - but lots of devils in details - result can sometimes be good, but often bad

Art includes Event data model, Data products, Configuration system, input/output Root files

We want to use Art as our Framework

Feed results from one simulation to another (or to analysis) in the same program

Art has data sources (producers), filters, processors, and services

We're starting with g2MIGTRACE. It already has a step that converts G4 objects to standard C++ objects that go into Root

Change g2MIGTRACE to convert G4 objects that go into Art. Also need to split the beamon action

Mu2e has done much of this work already!!!!

Art will be the offline framework too!

In summary

g-2 has dedicated computing and disk at Fermilab

Fermilab hosts collaboration tools

We have the beginnings of a software system

So we can work together

Several of us are using and working on g2MIGTRACE

Significant plans for g2MIGTRACE

Would like to incorporate other packages (yours?) into Art